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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, FIELD AND DEPOT MAINTENANCE MANUAL

PREAMPLIFIER AM-1841B/USM

HEADQUARTERS, DEPARTMENT OF THE ARMY
JULY 1963

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Technical Manual)
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HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, D.C., 31 July 1963

Operator, Organizational, Field and Depot Maintenance Manual
PREAMPLIFIER AM-1841B/USM

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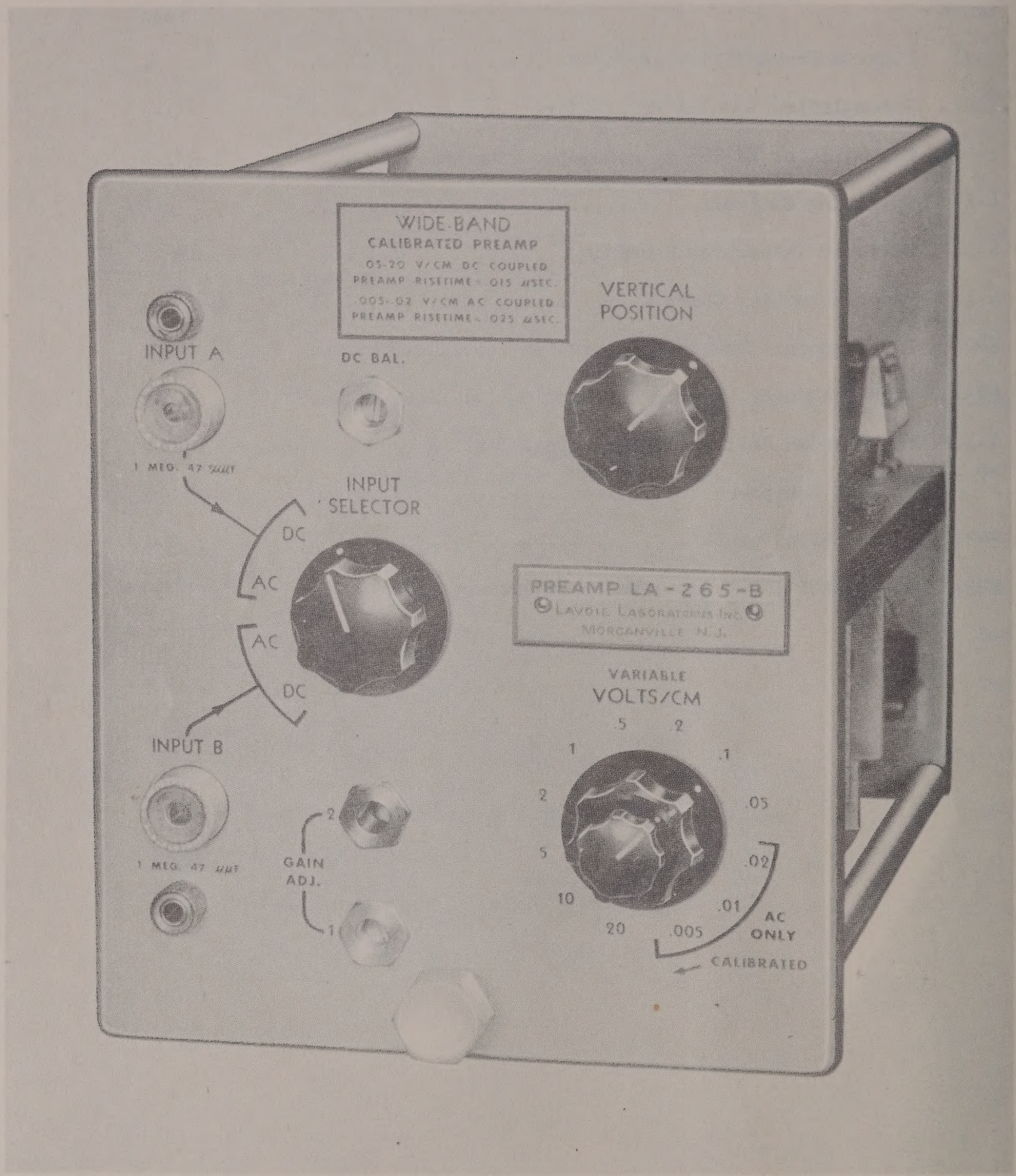

Figure 1-1. Plug-in Preamplifier LA-265-B.

SECTION A

GENERAL

A-1. Throughout this manual, reference is made to Plug-In Preamplifier LA-265-B, which is a commercial designation and is identical with Preamplifier AM-1841B/USM. This is a first-edition manual containing preliminary and unreviewed information compiled by the manufacturer of the equipment. Judicious caution should be exercised in using the information in this manual until it is replaced by a revised edition.

A-2. INDEX OF PUBLICATIONS.

A-3. Refer to the latest issue of DA PAM 310-4 to determine whether there are new editions, changes, or additional publications pertaining to your equipment. Department of the Army Pamphlet No. 310-4 is an index of current Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders which are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest changes to and revisions of each equipment publications.

A-4. FORMS AND RECORDS.

A-5. a. REPORTS OF MAINTENANCE AND UNSATISFACTORY EQUIPMENT. Use equipment forms and records in accordance with instructions in TM 38-750.

b. REPORT OF DAMAGED OR IMPROPER SHIPMENT. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), and AFR 71-4 (Air Force).

c. COMMENTS ON MANUAL. Forward all comments on this publication direct to: Commanding Officer, U. S. Army Electronics Materiel Support Agency, ATTN: SEIMS-MP, Fort Monmouth, New Jersey. (DA Form 1598 (Record of Comments on Publications), DA Form 2496 (Disposition Form), or letter may be used.)

SECTION I

INTRODUCTION AND DESCRIPTION

1-1. INTRODUCTION.

1-2. This technical manual presents operation and service instructions for the Plug-in Preamplifier, Lavoie Part Number LA-265-B (hereafter referred to as the preamplifier). The preamplifier is manufactured by Lavoie Laboratories, Inc., Morganville, New Jersey. (See figure 1-1.)

1-3. PURPOSE.

1-4. The preamplifier is a wide band, high gain, calibrated preamplifier for use in conjunction with oscilloscopes LA-265, LA-275, LA-275C, LA-285, and other campatible oscilloscopes.

1-5. LEADING PARTICULARS.

1-6. Figure 1-2 describes the leading physical and electrical characteristics of the preamplifier, when operated with the oscilloscopes listed.

1-7. PHYSICAL DESCRIPTION.

1-8. The preamplifier flush mounts into the front panel of the oscilloscope and is secured in place by a thumbscrew. A connector at the rear of the preamplifier mates with one in the oscilloscope to provide electrical interconnection. All operating controls and three calibrating controls are accessible at the front panel of the preamplifier.

1-9. PRINCIPLES OF OPERATION. (See figure 1-3.)

1-10. GENERAL. The preamplifier consists of one channel comprised of a push-pull amplifier stage preceded and followed by cathode follower stages. An additional stage of amplification is inserted by the VOLTS/CM control when the three most sensitive ac positions are utilized. Two input connectors are switched into the single channel output by means of the INPUT SELECTOR control.

1-11. INPUT SELECTOR CIRCUIT. Because there are two input connectors, and only one output channel, selection of one of two signals is determined by the INPUT SELECTOR control, SW3022. In addition to selecting the input, A or B, the INPUT SELECTOR control selects dc or ac input coupling. In the dc position, the signal is fed directly to the grid of the input cathode follower tube V3252. In the ac position,

	LA-265 LA-285	LA-275 LA-275S
Risetime (when used with Oscilloscopes listed or equivalent) Input Sensitivity, .05 to 20 volts/cm Input Sensitivity, .005 to .02 volts/cm	 15 Nsec 30 Nsec	 13 Nsec 30 Nsec
Bandpass (when used with Oscilloscopes listed or equivalent) .05 to 20 volts/cm .005 to .02 volts/cm (AC only)	 DC: dc to 20 mc; AC: 2 cps to 20 mc. 3 cps to 12 mc	 DC: dc to 27 mc AC: 2 cps to 27 mc 3 cps to 12 mc
Vertical Deflection factor	.05 volts/cm to 50 volts/cm dc; .005 volts/cm to 50 volts/cm ac. Calibrated 12 steps, .005 volts/cm to 20 volts/cm.	
Vertical Deflection Accuracy	±3%	
Modes of Operation	Two input connectors, only one input may be displayed at any one time. More than 60 db isolation between signal inputs.	
Input Impedance Without Probe With Probe	 One megohm shunted by 47 uuf. Ten megohm shunted by 11 uuf.	
Unit Weight	Approximately 3.5 pounds.	
Unit Size	11-3/4 x 5-7/8 x 7 inches.	

Figure 1-2. Preamplifier Leading Particulars

capacitor C3042 is inserted into the signal path by the SW3022D wafer; which removes the dc component of the signal.

1-12. INPUT ATTENUATORS. The VOLTS/CM control inserts four frequency compensated attenuators, either singly or in pairs, to provide nine fixed calibrated vertical sensitivities. Capacitor C3022 is inserted into the signal path by the VOLTS/CM control, SW3142A, to ensure that only ac signals are applied to the preamplifier in the three most sensitive attenuator positions. The X1 attenuator network compensates for stray inductance in the input circuit.

1-13. INPUT CATHODE FOLLOWER. The signal from the attenuators is applied to the grid of tube V3252 (except in the three most sensitive positions) functioning as a cathode follower to isolate the input circuit from the capacitance of the following stages. The output from tube V3252 is applied to the grid of tube V3402, functioning in conjunction with tube V3552 as a phase-splitting amplifier stage.

1-14. AC ONLY INPUT AMPLIFIER. When one of the three most sensitive AC ONLY positions of the VOLTS/CM control is selected, wafer F of SW3142 connects the input signal to the grid of amplifier tube V4302. Tube V4102A functions as a low impedance voltage setter for the screen grid of tube V4302. The output from tube V4302 is direct coupled to the grid of tube V4102B, a cathode follower. The output of tube V4102B is fed to the grid of tube V3552 only in the three most sensitive positions of the VOLTS/CM switch, by wafer SW3142H.

1-15. The gain of the AC ONLY amplifier, tube V4302, is controlled by front panel potentiometer R4352 labeled GAIN ADJ 2. The potentiometer adjusts the degeneration within the cathode circuit, thus controlling the stage gain. Low Freq. Comp potentiometer R4172 adjusts the time constant of the grid circuit coupling network, which provides low frequency compensation down to 50 cps.

1-16. Front panel DC BAL adjustment R4402 located within the grid circuit of tube V3552, adjusts the grid voltage so that the cathode potential is the same as the cathode potential of tube V3402. When the two cathode potentials are equal, there is no vertical shift in the trace when the VARIABLE control is rotated.

1-17. PHASE SPLITTER. The single ended signal input to the phase-splitter, whether it is from tube V3252 or tube V4102, is converted into a push-pull signal by the action of the common-cathode, phase-splitter amplifier stage consisting of tubes V3402 and V3552. Coils L3402 and L3582 form peaking networks in the plate circuit to provide good high frequency response. The VARIABLE control, potentiometer R3512, varies the cathode circuit degeneration. The front panel screwdriver adjustment labeled GAIN ADJ 1, potentiometer R3542, varies the current of this stage ensuring that the gain of the stages is such that the fixed positions of the VOLTS/CM control are correct.

1-18. Vertical positioning is controlled by the VERTICAL POSITION control, dual potentiometer R3712. The dual potentiometers are so connected that rotation of the VERTICAL POSITION control causes greater plate current flow in one of the output cathode followers, and a decreased flow in the other. Since the last stage is direct coupled, the change in plate current causes a shift in dc level of the entire output stage, therefore the trace is shifted vertically. The Vert Pos. Range potentiometer, R3762, adjusts the dc plate level of the last stage so the trace position can be centered when the VERTICAL POSITION control is centered.

1-19. OUTPUT CATHODE FOLLOWERS. The output cathode followers, tubes V3812A and B, provide an impedance match to the vertical amplifier circuits within the oscilloscope. The two push-pull signals, 180 degrees out of phase in relation to each other, are fed out of pins 1 and 3 of the interconnecting plug to the oscilloscope vertical amplifier. .The H. F. Peaking potentiometer, R3872, varies the current in the common cathode circuit, thereby affecting the series peaking coils, L3842 and L3942 which provide high frequency peaking. Two capacitors, C3842 and C3942, provide cross coupled balancing between the two output tubes, thus aiding the high frequency response.

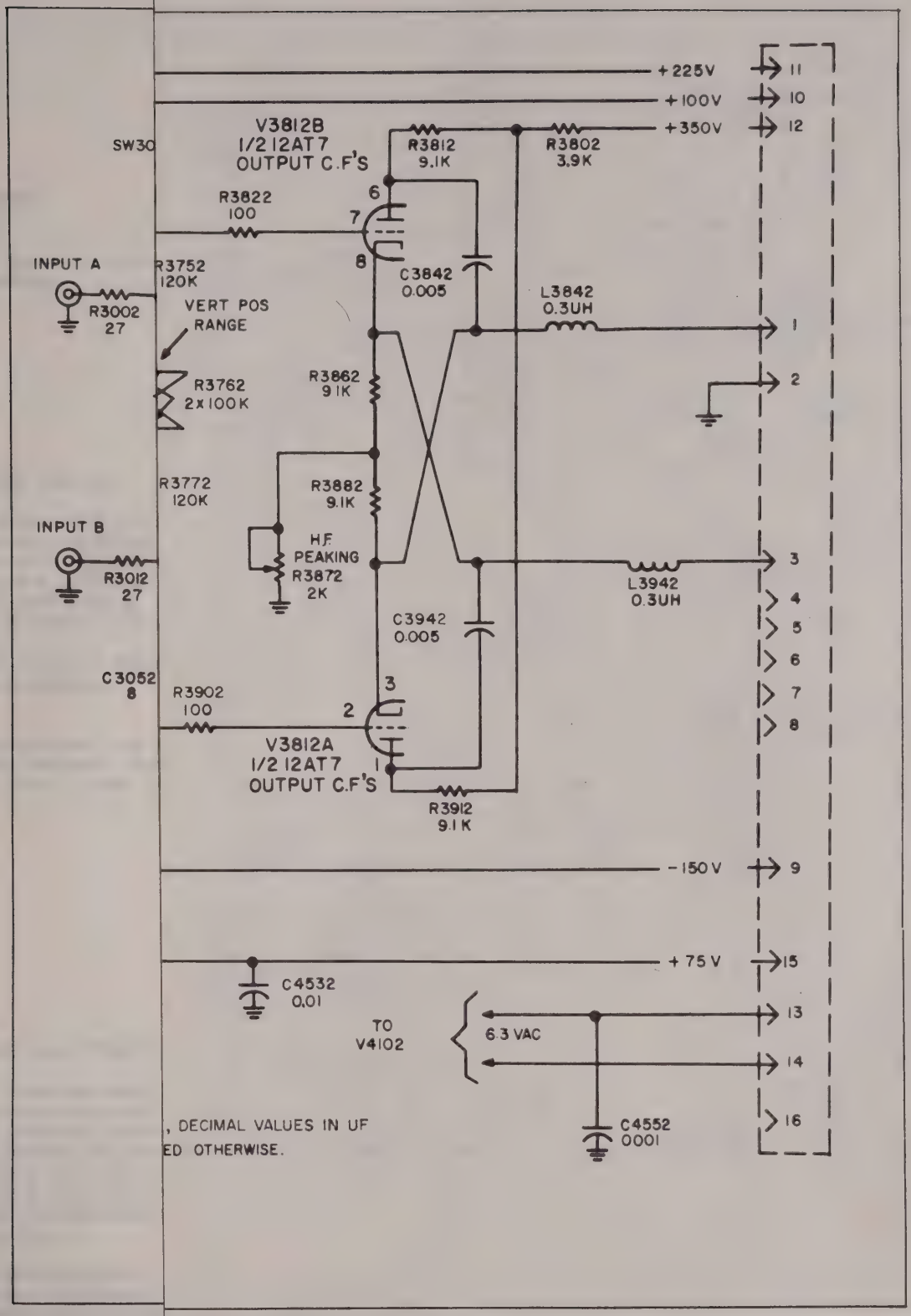

Figure 1-3. Preamplifier LA-265-B, Schematic Diagram

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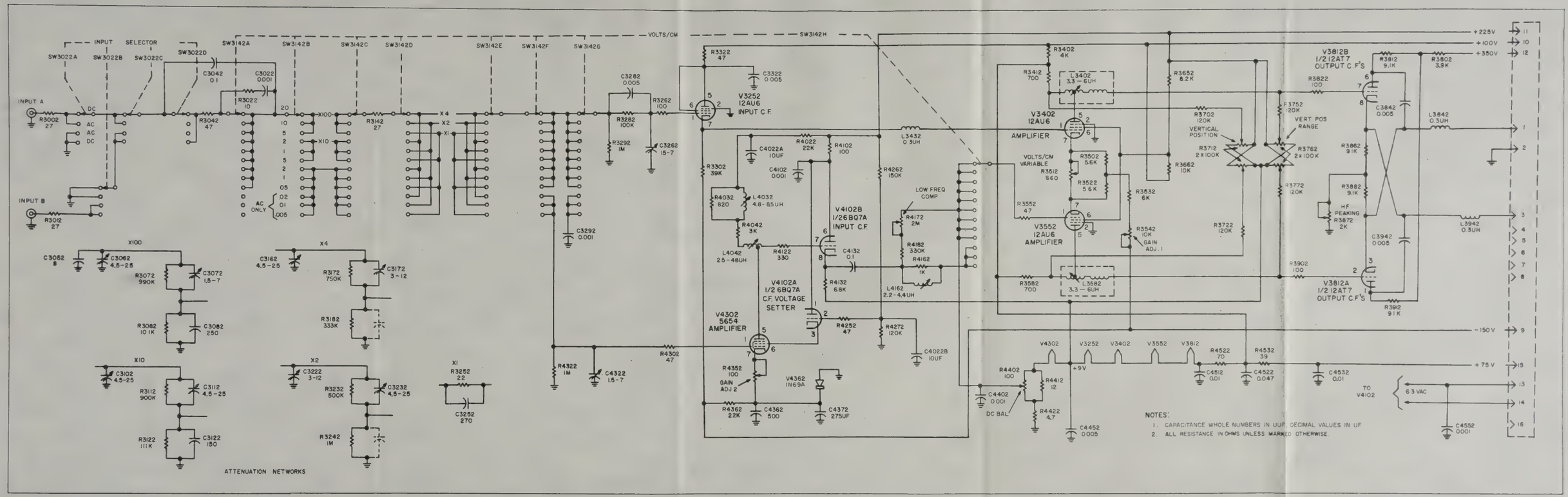

Figure 1-3. Preamplifier LA-265-B, Schematic Diagram

SECTION II

SPECIAL SERVICE TOOLS

2-1. INTRODUCTION.

2-2. Special tools are not required to operate or maintain the preamplifier.

2-3. Figure 7-1 lists standard test equipment utilized during maintenance and calibration of the preamplifier. The standard test equipment listed in figure 7-1 may be replaced or supplemented by equipment of equivalent capabilities.

SECTION III

PREPARATION FOR USE OR STORAGE

3-1. PREPARATION FOR USE.

3-2. Remove the preamplifier from the shipping container using care to avoid denting, scratching or marring the surface of the equipment. Visually inspect the preamplifier as follows:

a. Check the front panel controls, connectors, and engraving for ease of operation, security, and cleanliness as applicable.

b. Check all parts for broken wires, abraded insulation, and general condition.

3-3. Upon ascertaining that the preamplifier has not been damaged during shipment, secure it to the oscilloscope front panel. Guide the plug-in preamplifier into the access provided, until it bottoms. Press the preamplifier firmly into the mating connector and secure it with the thumbscrew at the bottom of the preamplifier.

3-4. STORAGE.

3-5. For short term storage intervals, the preamplifier may be placed into its shipping container, or on padding in a cabinet in a weather protected area where it will not be subjected to rough handling. Storage for long intervals requires that bagged desiccant, Specification MIL-D-3464, be placed inside the shipping container. Fungus treatment shall be performed in accordance with Specification MIL-T-152, to the extent required by local climate conditions.

SECTION IV

OPERATION INSTRUCTIONS

4-1. PRELIMINARY ADJUSTMENTS.

4-2. GENERAL. There are two adjustments that must be made prior to operating the preamplifier for the first time, and periodically thereafter. These adjustments, the dc balance and gain adjustment must be checked periodically due to tube and circuit aging, or errors may result in obtaining vertical amplitude measurements. The two adjustments are described in paragraphs 4-3 and 4-4.

4-3. DC BALANCE ADJUSTMENT. If the trace shifts vertically as the VARIABLE control is rotated, the DC BAL adjustment shall be made as follows:

a. Rotate the VARIABLE control back and forth and observe the trace.

b. Adjust the front panel DC BAL control until no noticeable movement is observed.

4-4. GAIN ADJUSTMENT. Proceed as follows:

a. Set the controls as indicated:

1.	VOLTS/CM	.05
2.	VARIABLE	CALIBRATED
3.	INPUT SELECTOR	INPUT A AC
4.	AMPLITUDE CALIBRATOR (oscilloscope)	.2 VOLTS

b. Connect the CAL. OUT. connector, using the test lead, to the INPUT A connector.

c. Adjust the front panel GAIN ADJ. 1 for exactly four centimeters vertical deflection.

d. Set the AMPLITUDE CALIBRATOR control at 20

MILLIVOLTS, and the VOLTS/CM control at the .005 position.

e. Adjust the front panel GAIN ADJ. 2 for exactly four centimeters vertical deflection.

4-5. OPERATING CONTROLS.

4-6. The purpose and use of controls utilized during operation of the preamplifier is described in figure 4-1.

4-7. OPERATING PROCEDURE.

4-8. Operation of the preamplifier consists of connecting each signal to be displayed to one of the input connectors. Rotate the INPUT SELECTOR to the channel desired to be displayed, and set the VOLTS/CM control for a satisfactory display. Position the trace on the crt using the VERTICAL POSITION control.

Note

If one signal is much greater in amplitude there might be cross feed between the two input circuits. If this results, disconnect the strong signal when not being viewed.

Control	Purpose or Use
INPUT SELECTOR	Four-position selector, selects either A or B channel input, and whether signal is ac or dc coupled.
VERTICAL POSITION Control	Positions trace vertically.
VOLTS/CM rotary switch (black knob)	Provides fixed calibrated vertical deflection factors when the VARIABLE control is at the CALIBRATED position.
VARIABLE (red knob)	Provides continuously variable vertical deflection factors between those selected by the position of the VOLTS/CM control.
INPUT A INPUT B connectors	Provide means of connecting signal, either with a probe or a cable.

Figure 4-1. Operating Controls

SECTION V

PERIODIC INSPECTION, MAINTENANCE, AND LUBRICATION

5-1. GENERAL.

5-2. This section contains instructions concerning periodic inspection and maintenance of the preamplifier.

5-3. PERIODIC INSPECTION. Figure 5-1 outlines the inspection procedure for the preamplifier.

5-4. MAINTENANCE. Maintenance of the preamplifier is limited to correcting the defects or failures noted during periodic inspections or use. If any defective components have to be replaced, the calibration procedures outlined in Section VII shall be accomplished following repair.

CAUTION

Repairs requiring soldering on the ceramic terminal boards require use of heat not to exceed that supplied by a 75 watt iron, or damage to the ceramic terminal strips may result.

5-5. LUBRICATION. The preamplifier requires no lubrication.

Component	Time Period	Inspection
Front panel controls and connectors.	3 months	Check for ease of operation, security, and evidence of damage.
Chassis parts, wires and electrical connector.	3 months	Check for mounting security, corrosion, overheating, bent or burned pins, abraded insulation, as applicable.
Front panel markings.	3 months	Check for cleanliness and clarity.

Figure 5-1. Periodic Inspection Schedule

SECTION VI

TROUBLESHOOTING

6-1. GENERAL.

6-2. The troubleshooting chart, figure 6-1 is provided for quick reference by maintenance personnel. The chart is to be used in conjunction with the schematic diagram, figure 1-3, to isolate malfunctions within the preamplifier.

6-3. Troubleshooting procedures should be performed with the preamplifier connected to the oscilloscope. Access to components can be gained by removing the left side cover and bottom plate of the oscilloscope. It will, however, be necessary to remove the preamplifier to change tubes or circuit components.

Trouble	Probable Cause	Remedy
No signal in AC ONLY position of VOLTS/CM control.	Defective tubes.	1. Substitute new tube for V4302 and V4102. 2. Check associated tube circuit parts.
No signal in any position of VOLTS/CM control.	Open filament.	Check tubes for open filament. Replace defective tube.
No signal in either AC input position.	Open capacitor.	Check C3042 for open.

Figure 6-1. Troubleshooting Chart (Sheet 1 of 2)

Trouble	Probable Cause	Remedy
Low frequency waveform distortion (AC ONLY position of VOLTS/CM control) See Fig. 6-2a.	Low frequency attenuation.	1. Adjust the Low Freq. Comp. potentiometer R4172 as described in Paragraph 7-11. 2. Check capacitor C4022A and resistor R4022.
Low frequency waveform distortion (AC ONLY position of VOLTS/CM control) See Fig. 6-2b.	Over-compensation of low frequencies.	Adjust the Low Freq. Comp. potentiometer R4172 as described in Paragraph 7-11.
Insufficient high frequency peaking. (See figure 6-3a.	Insufficient tube transconductance.	1. Check tube transconductance, replace as necessary. 2. Check for short or partial short in peaking coils L3402, L3582, L3842 and L3942. 3. Check capacitors C3842 and C3942.
High frequency over shoot distortion. (See figure 6-3b.)	Excessive high frequency peaking.	Adjust H. F. Peaking potentiometer R3872 as described in paragraph 7-12.

Figure 6-1. Troubleshooting Chart (Sheet 2 of 2)

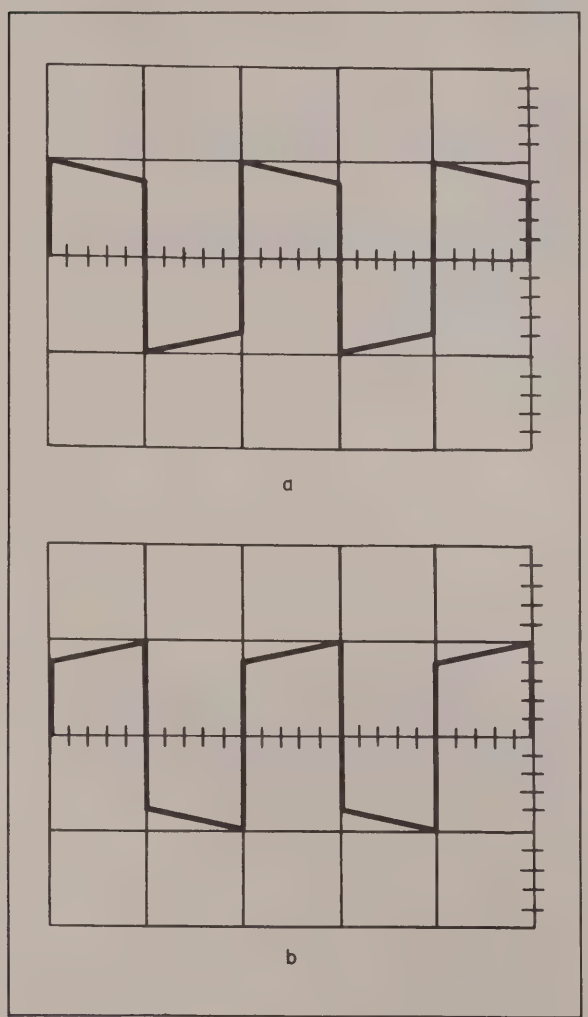

Figure 6-2. Low Frequency Distortion

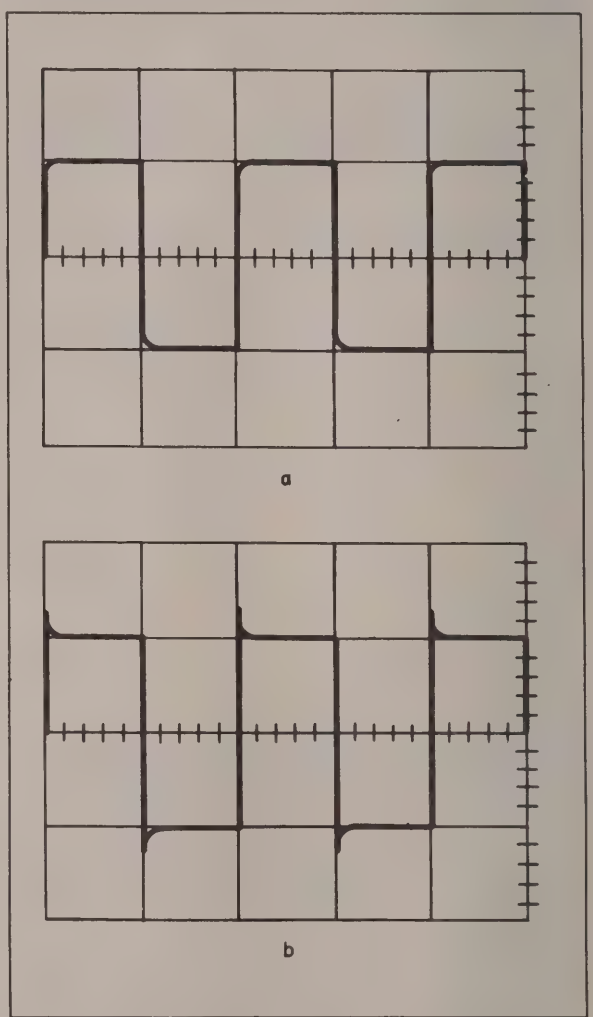

Figure 6-3. High Frequency Waveform Distortion

SECTION VII

CALIBRATION

7-1. INTRODUCTION.

7-2. This section contains procedures for calibrating the preamplifier following parts replacement, prolonged storage, shipment, four hundred hours of use, or every six months, whichever occurs first, to ensure maximum accuracy. Following the calibration procedure, perform the tests described in paragraph 7-13 to ensure serviceability.

Note

Refer to the Troubleshooting Chart, figure 6-1, if troubles are encountered during the calibrating procedures.

7-3. CALIBRATION EQUIPMENT REQUIRED. The test equipment required to calibrate the preamplifier is listed in figure 7-1. The test equipment may be replaced or supplemented by an equivalent type.

7-4. CALIBRATION PROCEDURE. Prior to performing any calibation procedures, plug the preamplifier into the oscilloscope (with left side and bottom covers removed), and apply power for a warm-up period of ten minutes. Preset the oscilloscope and preamplifier front panel controls as follows:

Oscilloscope	
TRIGGERING MODE	AUTO

Nomenclature	Part Number or Model	Application	Range	Accuracy
Oscilloscope	LA-265* (Lavoie)	Preamplifier plug-in.		
Squarewave Generator	Type 105 (Tektronix)	Frequency compensation.	Risetime no longer than .02 microseconds; output frequency of 25 cps to 1 mc.	±3%
Squarewave Generator	Type 107 (Tektronix)	High frequency peaking.	Risetime no longer than 3 millimicroseconds; output frequency 400 KC to 1 MC.	±3%
Constant Amplitube Signal Generator	Type 190 (Tektronix)	Final testing.	Constant amplitude sine wave, 50 KC to 30 MC.	±2%
Input Capacitance Standardizer	Type CS-47 (Tektronix)	Adjust input capacitance.	47 uuf.	
52 Ohm Termination	Part No. 011-001 (Tektronix)	Terminates 107 generator.		
"L" Pad	B52-L10 (Tektronix)	Adjust input capacitance.		

*Oscilloscopes LA-275, LA-275C, or LA-285 may also be used. When the LA-275 or LA-275C is employed, the maximum range in the BANDPASS TEST (paragraph 7-16c) should be extended to 27 MC.

Figure 7-1. Recommended Calibration and Final Testing Test Equipment

Oscilloscope (cont)	
TRIGGER SLOPE	+INT
TIME/CM	1 MILLISEC
5X MAGNIFIER	OFF
HORIZONTAL DISPLAY	'A'
HORIZONTAL POSITION	centered
Preamplifier	
INPUT SELECTOR	INPUT A DC
VOLTS/CM	.05
VARIABLE	CALIBRATED

7-5. Perform the calibration procedures in the order that follows.

Note

All controls shall be returned to the initial settings after each adjustment.

7-6. DC BALANCE AND GAIN ADJUSTMENT. The dc balance and gain adjustments are front panel screwdriver adjustments that are performed periodically during use of the preamplifier, and are described in paragraphs 4-3 and 4-4. These two adjustments shall be performed prior to proceeding with the remaining calibration procedures.

7-7. VERTICAL POSITIONING ADJUSTMENT. Proceed as follows:

a. Short pins 1 and 3 of interconnecting plug together, note position of trace on crt. Remove short.

b. Set VERTICAL POSITION control to mid-position.

c. Adjust the Vert. Pos. Range potentiometer, R3762 (see figure 7-2), to position the trace to the point noted in step a.

7-8. MAIN AMPLIFIER INPUT CAPACITANCE ADJUSTMENT. Proceed as follows:

a. Connect coaxial cable P52 to output connector of Type 105 square-wave generator.

b. Connect the B52-L10 "L" pad between other end of the P52 cable and the Type CS-47 input capacitance standardizer.

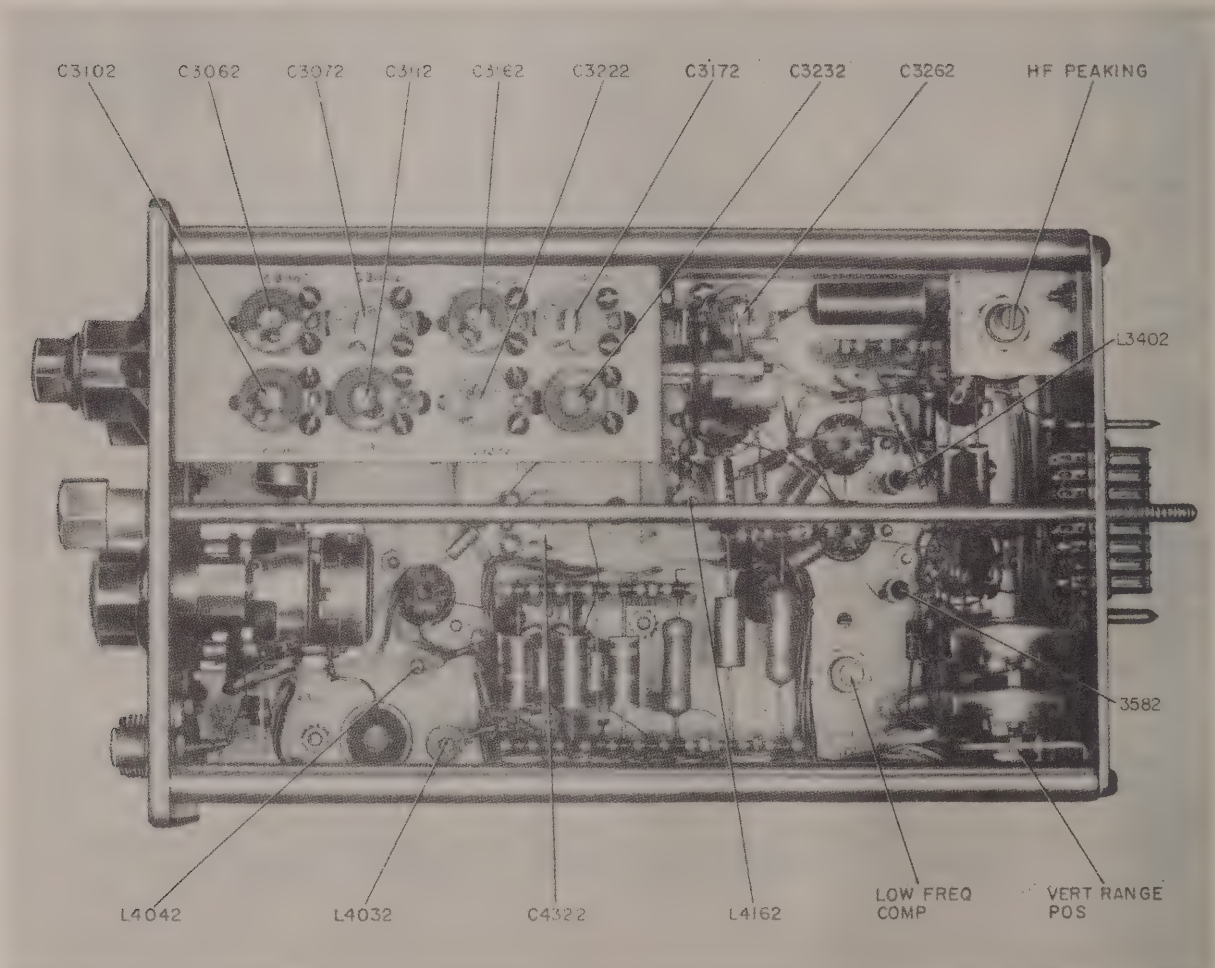

Figure 7-2. Calibration Points

c. Connect the other end of Type CS-47 input capacitance standardizer to the INPUT A connector.

Note

If the test equipment required for steps a through c is not available, a probe which has been calibrated to a preamplifier (47 uuf input impedance) known to be in correct adjustment may be substituted.

d. Set the Type 105 squarewave generator FREQUENCY control for an approximate output of 1000 cycles.
e. Set the Type 105 OUTPUT AMPLITUDE control for a vertical deflection of approximately 3.5 centimeters.
f. Adjust variable capacitor C3262 (see figure 7-2) for the most optimum squarewave.

7-9. ATTENUATOR CAPACITANCE ADJUSTMENT. Proceed as follows:
a. Leave the test equipment and controls set as in the previous paragraph.
b. Rotate the VOLTS/CM control to the position listed in figure 7-3, and adjust the capacitors associated (see figure 7-2), for a square corner and flat top. Remove the B52-L10 "L" pad before adjusting the .5 and 5 Volt/CM steps.

7-10. AC ONLY INPUT CAPACITANCE ADJUSTMENT. Proceed as follows:
a. Replace B52-L10 "L" pad. Leave controls and test equipment as described in paragraph 7-8, except VOLTS/CM control which shall be set to .005 position.
b. Adjust capacitor C4322 for the optimum squarewave.

7-11. LOW FREQUENCY COMPENSATION ADJUSTMENT. Proceed as follows:
a. Leave controls and test equipment as described in previous paragraph 7-10, except change the Type 105 OUTPUT FREQUENCY to 50 cps.
b. Adjust the Low Freq. Comp potentiometer, R4172, for the optimum squarewave.

7-12. HIGH FREQUENCY PEAKING ADJUSTMENT. Proceed as follows:
a. Change the oscilloscope and preamplifier controls as indicated:

1. TIME/CM	.2 USEC
2. VOLTS/CM	.05

b. Connect the 011-00/52 ohm termination to the Type 107 squarewave generator output connector, and connect the Type B52 coaxial cable from the termination to the INPUT A connector.
c. Adjust the Type 107 squarewave generator for an output frequency of approximately 450 KC, and amplitude of three centimeters.
d. Adjust coils L3402 and L3582 (see figure 7-2) for optimum square corner, and flat top of displayed squarewave.
e. Adjust the H. F. Peaking potentiometer, R3872 (see figure 7-2) for optimum square corner with no overshoot.

Note

The adjustments described in steps d and e interact, therefore several adjustments may be necessary for optimum results.

f. Set the VOLTS/CM control at .005 position.
g. Adjust coils L4032, L4042, and L4162 for the optimum squarewave.

7-13. FINAL TESTING.

7-14. GENERAL. Upon completion of calibration procedures, perform the following test to ensure serviceability.

7-15. VERTICAL POSITIONING TEST. Turn VERTICAL POSITION control and check that it is capable of positioning the beam vertically over the four centimeter calibrated portion of the graticule.

7-16. BANDPASS TEST.
a. Change oscilloscope and preamplifier controls as indicated.

1. TRIGGER MODE	AC
2. TIME/CM	50 MILLISEC
3. VOLTS/CM	.05

b. Connect constant amplitude generator to INPUT A. Set frequency to 350 KC. Set output amplitude to obtain 3 centimeters of vertical deflection.
c. Increase frequency of generator until 20 MC is reached. The vertical deflection amplitude shall not be more than 3 db down (2.1 centimeter deflection) over the range.
d. Set VOLTS/CM to .005. Repeat the above tests with generator amplitude set for 3 centimeters of vertical deflection (using "L" pad), over the range of 350 KC to 12 MC. The vertical deflection amplitude shall not be more than 3 db down (2.1 centimeter deflection) over this range.

VOLTS/CM Setting	Square Corner Adjust	Flat Top Adjust
.1	C3232	C3222
.2	C3172	C3162
.5	C3112	C3102
5	C3072	C3062

Figure 7-3. Attenuator Input Capacitance Adjustments

SECTION VIII

MAINTENANCE INSTRUCTIONS

8-1. SCOPE OF OPERATOR' S MAINTENANCE.

8-2. The maintenance duties assigned to the operator of Preamplifier AM-1841B/USM are listed below, together with a reference to the paragraphs covering the specific maintenance function. The duties assigned do not require tools or test equipment other than those issued with the equipment.

a. Daily preventive maintenance checks and services (para 8-4).

b. Weekly preventive maintenance checks and services (para 8-5).

c. Cleaning (para 8-6).

8-3. OPERATOR'S PREVENTIVE MAINTENANCE. Operator's preventive maintenance is the systematic care, servicing, and inspection of the equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. SYSTEMATIC CARE. The procedures given in paragraphs 8-4, 8-5, and 8-6 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. PREVENTIVE MAINTENANCE CHECKS AND SERVICES. The preventive maintenance checks and services charts (para 8-4, 8-5, and 8-9) outline functions to be performed at specific intervals. These checks and services are designed to maintain Army equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and what the normal conditions are; the References column lists the paragraphs that contain detailed repair or replacement procedures. If the defect cannot be remedied by the operator, higher echelon maintenance or repair is required. Records and reports of these checks and services must be made in accordance with TM 38-750.

8-4. DAILY PREVENTIVE MAINTENANCE CHECKS AND SERVICES CHART.

Sequence No.	Item	Procedure	References
1	Preamplifier	Check preamplifier for completeness and general condition.	Appx III.
2	Exterior surfaces.....	Clean exterior surfaces of the equipment.	Para 8-6.
3	External receptacles...	Inspect external receptacles for breakage and firm seating.	
4	Knobs and switches.....	While making the operating checks (item 5), observe that the mechanical action of each knob, dial, and switch is smooth and free of external or internal binding.	
5	Operation	Operate the preamplifier as described in section IV. During operation, be alert for any unusual performance, response, or condition.	

8-5. WEEKLY PREVENTIVE MAINTENANCE CHECKS and SERVICES CHART.

Sequence No.	Item	Procedure	References
1	Preservation	Inspect the equipment to determine that it is free of bare spots, rust, and corrosion. If these conditions exist, refer to higher echelon for repair.	None.

8-6. CLEANING. Inspect the exteriors of the equipment. The exterior surfaces should be free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

Warning: Cleaning Compound (Federal stock No. 7930-395-9542) is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with cleaning compound.

c. Remove dust or dirt from plugs and jacks with a brush.

d. Clean the front panels and control knobs; use a soft clean cloth. If dirt is difficult to remove, dampen the cloth with water; if necessary, use mild soap.

8-7. PREVENTIVE MAINTENANCE.

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operation capability, Preventive maintenance is the responsibility of all echelons concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of Preamplifier AM-1841B/USM at the second echelon level are made at monthly intervals unless otherwise directed by the commanding officer.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

8-8. MONTHLY MAINTENANCE. Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (para 8-9) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance checks and services. Equipment in limited storage (requires service before operation) does not require monthly preventive maintenance.

8-9. MONTHLY PREVENTIVE MAINTENANCE CHECKS AND SERVICES CHART.

Sequence No.	Item	Procedure	References
1	Publications	Inspect manual for completeness and to see if it is in usable condition. Be sure that all Changes to the manual are on hand.	DA Pam 310-4.
2	Modification work orders.	Check to see that all URGENT MWO's have been applied and that all ROUTINE MWO's have been scheduled.	DA Pam 310-4.
3	Completeness.....	Check the equipment for completeness and general condition.	Appx III.
4	Cleanliness	Clean exterior surfaces of the equipment.	Para 8-6.
5	Preservation	Inspect the equipment to determine that it is free of bare spots, rust, and corrosion.	Para 8-10.
6	External receptacles...	Inspect external receptacles for breakage and firm seating.	

8-9. MONTHLY PREVENTIVE MAINTENANCE CHECKS AND SERVICES CHART (cont).

Sequence No.	Item	Procedure	References
7	Interior.....	Inspect interior components and hardware for cleanliness and general physical condition. a. Interior components and hardware must be free of dust, dirt, corrosion, fungus, and moisture. b. Resistors and wiring must be free of cracks, blistering, burns, and discoloration.	
8	Knobs and switches....	During operation (item 9) observe that the mechanical action of each knob and switch is smooth and free of external or internal binding.	
9	Performance.....	Be alert for any abnormal condition when operating this equipment.	Section IV.

8-10. RUSTPROOFING AND PAINTING

a. Rustproofing. When the finish on the preamplifier has become badly scarred or damaged, rust and corrosion can be prevented by touching up the bared surfaces. Use No. 000 sandpaper to clean the surface down to the bare metal. Obtain a bright smooth finish.

b. Painting. Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9-213.

APPENDIX I

REFERENCES

Following is a list of applicable publications available to the operator and repairman of Preamplifier AM-1841B/USM.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TM 9-213	Painting Instructions for Field Use.
TM 38-750	The Army Equipment Record System and Procedures.

APPENDIX II

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

1. General

a. This appendix assigns maintenance functions to be performed on components, assemblies, and subassemblies by the lowest appropriate maintenance echelon.

b. Columns in the maintenance allocation chart are as follows:

(1) Component. This column shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the component. Components, assemblies, and subassemblies are listed in top-down order. That is, the assemblies which are part of a component are listed immediately below that component, and the subassemblies which are part of an assembly are listed immediately below that assembly. Each generation breakdown (components, assemblies, or subassemblies) are listed in disassembly order or alphabetical order.

(2) Maintenance function. This column indicates the various maintenance functions allocated to the echelons.

(a) Service. To clean, to preserve, and to replenish lubricants.

(b) Adjust. To regulate periodically to prevent malfunction.

(c) Inspect. To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

(d) Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.

(e) Replace. To substitute serviceable components, assemblies, or subassemblies, for unserviceable components, assemblies, or subassemblies.

(f) Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

(g) Align. To adjust two or more components of an electrical system so that their functions are properly synchronized.

(h) Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

(i) Overhaul. To restore an item to completely serviceable condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

(j) Rebuild. To restore an item to a standard as near as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and/or specifications and subsequent reassembly of the item.

(3) 1st, 2d, 3d, 4th, 5th echelons. The symbol X indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.

(4) Tools required. This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicates the tool, test, and maintenance equipment required to perform the maintenance function.

(5) Remarks. Entries in this column will be utilized when necessary to clarify any of the data cited in the preceding column.

c. Columns in the allocation of tools for maintenance functions are as follows:

(1) Tools required for maintenance functions. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

(2) 1st, 2d, 3d, 4th, 5th echelon. The dagger (†) symbol in these columns indicates the echelons normally allocated the facility.

(3) Tool code. This column lists the tool code assigned.

2. Maintenance by Using Organizations

When this equipment is used by signal services organizations organic to theater headquarters or communication zones to provide theater communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

Section II. MAINTENANCE ALLOCATION CHART

PART OR COMPONENT	MAINTENANCE FUNCTION	ECHELON 1	2	3	4	5	TOOLS REQUIRED	REMARKS
PREAMPLIFIERS AM-1841/USM, AM-1841A/USM, AND AM-1841B/USM	service		X				14	
	adjust				X		7,12	
						X	3,7,10,12,13	
	inspect		X					Visual only
	test				X		1,2,4,5,6,7,9	
						X	1,2,4,5,6,8,9,11	
	replace				X		10	
	repair				X		10	
	calibrate					X	3,6,10,12,13	
	rebuild					X	1 thru 13	
	overhaul					X	1 thru 13	

Section III. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	ECHELON 1	2	3	4	5	TOOL CODE	REMARKS
AM-1841/USM, AM-1841A/USM, AND AM-1841B/USM (continued)							
AUDIO OSCILLATOR TS-382/U				†	†	1	
FREQUENCY METER AN/USM-26				†	†	2	
GENERATOR, ELECTRONIC MARKER AN/USM-109					†	3	CONUS Depot only
MULTIMETER TS-352/U				†	†	4	
MULTIMETER, METER ME-26/U				†	†	5	
OSCILLOSCOPE AN/USM-81				†	†	6	
SQUARE WAVE GENERATOR, SG-299/U				†	†	7	
TEST SET, ELECTRON TUBE TV-2/U					†	8	
TEST SET, ELECTRON TUBE TV-7/U				†	†	9	
TOOL KIT TK-100G				†	†	10	
TRANSFORMER, VARIABLE POWER CN-16/U					†	11	
VOLTAGE DIVIDER TS-265/U				†	†	12	
VOLTMETER, DIGITAL AN/GSM-64					†	13	
TOOLS AND TEST EQUIPMENT NORMALLY AVAILABLE TO THE REPAIRMAN USER BECAUSE OF HIS ASSIGNED MISSION		†				14	

APPENDIX III

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

1. General

This appendix lists items supplied for initial operation and for running spares. The list includes tools, accessories, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

2. Columns

a. Federal Stock Number. This column lists the 11-digit Federal stock number.

b. Designation by Model. The dagger (†) indicates model in which the part is used.

c. Description. Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

d. Unit of Issue. The unit of issue is each unless otherwise indicated and is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.

e. Expendability. Nonexpendable items are indicated by NX. Expendable items are not annotated.

f. Quantity authorized. Under "Items Comprising an Operable Equipment", the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spare Items" the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.

g. Illustration. The "Item No." column lists the reference symbols used for identification of the items in the illustration or text of the manual.

Section II. FUNCTIONAL PARTS LIST

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL						DESCRIPTION	UNIT OF ISSUE	EXP	QTY IN UNIT	ILLUSTRATION	
	1	2	3	4	5	6					FIG. NO.	ITEM NO.
							PREAMPLIFIERS AM-1841/USM; AM-1841A/USM, AND AM-1841B/USM					
6625-679-6509							PREAMPLIFIERS AM-1841/USM, AM-1841A/USM, AND AM-1841B/USM: used with various oscilloscopes such as AN/USM-81, AN/USM-120, AN/USM-151 or Tektronix Type Series 530, 540, and 550 to extend their usefulness by providing (2-channel) differential input with high rejection and cancellation of unwanted signals. Deflection factor 1MV/CM to 50V/CM; frequency response DC to 350 KCS. Required voltages are provided by plug in to oscilloscope in use.		NX			
							NOTE: Model Column 1 refers to AM-1841/USM; Column 2 refers to AM-1841A/USM; Column 3 refers to AM-1841B/USM					
							ITEMS COMPRISING AN OPERABLE EQUIPMENT					
Ord thru AGC	†	†	†				TECHNICAL MANUAL TM 11-6625-494-12P			2		
							RUNNING SPARE ITEMS					
5960-681-9596	†						ELECTRON TUBE: E1A, JETEC type 6922			1		V4102A,B
5960-679-0016		†	†				ELECTRON TUBE: Telefunken Platte type 6DJ8/ECC88 (used with AM-1841A/USM only in serial numbers 14440 thru 16540) (Not mounted)			1		V4102
5960-262-3781		†					ELECTRON TUBE: type 6BQ7A (used with serial numbers 13360 thru 14439) (Not mounted)			1		V4102
5960-262-0167	†						ELECTRON TUBE: MIL type 12AT7WA (Not mounted)			1		V3812
5960-866-5467		†	†				ELECTRON TUBE: Telefunken type 12AT7/ECC81			1		V3812
5960-577-1367	†	†	†				ELECTRON TUBE: MIL type 12AU6 (Not mounted)			3		V3252 V3402 V3552
5960-193-5115	†						ELECTRON TUBE: MIL type 5654/6AK5W (Not mounted)			1		V4302
5960-669-6863		†					ELECTRON TUBE: type 5654			1		V4302
5960-262-1357			†				ELECTRON TUBE: MIL type 6AK5			1		V4302

END

By Order of the Secretary of the Army:

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USA Corps (3)
USATC AD (2)
USATC Engr (2)
USATC Inf (2)
USATC Armor (2)
USASTC (5)
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Ft Monmouth (63)
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Br Svc Sch (2) except
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USA Elec RD Actv, Ft Huachuca (2)
USA Trans Tml Comd (1)
Army Tml (1)
POE (1)
USAOSA (1)
AMS (1)
WRAMC (1)
AFIP (1)
Army Pic Cen (2)
USA Mbl Spt Cen (1)
USA Elect Mat Agcy (12)
Chicago Proc Dist (1)
USARCARIB Sig Agcy (1)
Sig Fld Maint Shop (3)
Units organized under following TOE's (2 copies each unless otherwise indicated):
7
11–16
11–17
11–36
11–57
11–98
11–117
11–155
11–157
11–500 (AA–AC) (4)
11–557
11–587
11–592
11–597
17
32–56
37

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320–50.

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